

# What if hydrogen could help decarbonise European industry?

The European Union has an ambitious climate strategy and is looking for ways to boost technologies that will make it possible. Could hydrogen and the deployment of related technology and infrastructure become a decisive factor in decarbonising specific industry sectors?

The European strategies for [energy system integration](#) and for [hydrogen](#) have been in the limelight in recent months, and a related [resolution](#) was adopted during the European Parliament's plenary session in May 2021. Furthermore, in mid-July 2021, the European Commission adopted its 'Fit for 55' package of legislative proposals to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55 % by 2030, compared to 1990 levels.



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Achieving these emission reductions in the next decade is crucial for Europe to become the world's first climate-neutral continent by 2050, and for the [European Green Deal](#) to become a reality. The European Commission has set out a [vision](#) for a digitalised, [integrated](#) and circular energy system, driven by electrification, powered by renewables and relying on energy efficiency. Following a political agreement reached between the co-legislators and the Parliament's adoption of its position at first reading on 24 June 2021, the European Parliament and the Council adopted the [Regulation on a European Climate Law](#) earlier this year.

## Potential impacts and developments

The European hydrogen strategy envisages a path towards a European hydrogen ecosystem, with upscaling in the next five years followed by further interconnections across Europe and finally large-scale diffusion after 2030. This implies an increase in [renewable hydrogen](#) production, driving down the costs and boosting demand in hard-to-abate sectors, to make Europe the global hydrogen powerhouse, with a set of ambitious targets: 6 gigawatt (GW) of electrolyzers installed by 2024, and 40 GW by 2030. Key policy initiatives in this field also include the [EU Climate Law](#), the [EU climate target plan](#), the [EU Clean Hydrogen Alliance](#) and the forthcoming [hydrogen and decarbonised gas market package](#). Transforming the EU's energy system to take full advantage of the potential of hydrogen is perceived to provide benefits in terms of job creation, economic growth, innovation and reduced air pollution.

Hydrogen technologies cover the entire chain from hydrogen generation to its distribution and storage, and to its final utilisation in sectors including mobility, energy storage scale and industrial use. Here, the EU acts in a context of international partners and competitors that strive for similar goals and hold traditionally strong positions in the field of hydrogen technologies.

The [opinion](#) presented in June 2021 by the European Commission's [Group of Chief Scientific Advisors](#) and Science Advice for Policy by European Academies ([SAPEA](#)), as well as a recent [study](#) by STOA, provide an update on the state of play of hydrogen use in the EU economy. They also determine current policies and gaps, and propose policy options to fill these gaps to enable replacement of fossil fuels, particularly in [energy-intensive industries](#) and long-distance transport. In the past decade, almost a third of all transnational patents covering electrolytical hydrogen generation were generated by actors based within

the EU. This strength not only creates an opportunity, but also a responsibility towards promoting cost-effective supply on a global scale. The EU has the potential to become the global leader in the field, followed by the USA and Japan.

## Anticipatory policy-making

Sustainable use and production of hydrogen should be focused on hard-to-decarbonise sectors, and begin by contemplating its use predominantly in applications where there are no cheaper alternatives. However, clear guidelines and a hierarchy of such priority uses are lacking, while there is a need for support schemes to foster diffusion in sectors that need hydrogen. There is currently no significant hydrogen infrastructure or regulation, which may lead to uncertainty for market participants and potential grid operators. It is therefore important to clarify the rules for future markets. Furthermore, trading in hydrogen requires exact specification of the products, particularly renewable ([green H<sub>2</sub>](#)), but also [low-carbon hydrogen](#), as a way to scale up production (mainly blue H<sub>2</sub>, produced from natural gas using carbon capture and storage, [CCS](#)). Despite ongoing work on [certification schemes](#), specific criteria have not yet been agreed upon.

With regard to actors, regions and the international perspective, there is a lot of mobilisation in certain sectors for both hydrogen production and use, but civil society has not yet been addressed to a sufficient extent. Moreover, the role of hydrogen in the [Just Transition Mechanism](#) is yet to be defined. Future policies will need to foster a sustainable approach to international hydrogen partnerships, as, while there will be production of green hydrogen in the EU, imports will still be needed. International cooperation must be fostered while ensuring compatibility with partner countries' development strategies, such as acceptance of selected production and infrastructure sites, environmental impact of expanding renewable energy use and associated material flows (e.g. water), and socio-economic impacts and end-user costs.

[Public funding](#) and schemes such as carbon contracts for difference ([CCfDs](#)) are key to achieving a far larger scale of hydrogen technology deployment and for its production to become decarbonised, while private investment must also be fostered by providing certainty about the future pathway and political framework. Such a supportive framework is required in the case of infrastructure regulation, to lay down overarching rules and define elements that will allow future EU-wide local trade interconnectivity, while still providing leeway for regional experimentation, for example with respect to the refinancing of infrastructure. There is also a need to promote research and innovation in hydrogen technologies, e.g. through dedicated [European Innovation Council \(EIC\) Fund](#) calls and important projects of common European interest ([IPCEIs](#)).

The security of supply is crucial, with production and storage capacities having to match demand across Europe. It will be necessary to interconnect different users and producers, so that production scales up in line with consumption, and hydrogen infrastructure is initially deployed in regional clusters, before a broader roll-out after 2030. Hydrogen can be [blended with natural gas for transport](#) at limited percentages of 5 %-20 %, while higher shares of up to 30 % are being investigated. This, together with the possibility of [repurposing](#) infrastructure already in place, constitutes a good starting point to further develop the concept of [hydrogen valleys](#) and foster [hydrogen networks](#).

While perspectives for using alternatives such as hydrogen are growing, gas of fossil origin presently constitutes 95 % of [gaseous fuels](#) consumed in the EU, and accounts for about 22 % of total [EU energy consumption](#), 20 % of EU electricity production and 39 % of heat production. Hydrogen can be produced from almost all energy resources, although [today's use of hydrogen](#) in oil refining and chemical production is mostly covered by hydrogen from fossil fuels, with significant associated CO<sub>2</sub> emissions. However, as we look for solutions to decarbonise European industry, the share of hydrogen in the energy mix could rise significantly, as it can increasingly be produced from renewable energy. Through the uptake of new technologies still under development, especially those related to hydrogen, gaseous fuels are in any case expected to continue to account for a very significant part of total EU [energy consumption in 2050](#), while also ensuring [resilience](#).

Fighting climate change is a [key global trend](#) and the first of the [six policy priorities](#) set out by the von der Leyen Commission. The EU has the potential to become a [leader](#) in pilot technologies, with a high decarbonisation potential including in hydrogen production, storage, transport and use.